Integrated 2

Section 3-1 Systems and Graphs

Warm-up:

1. Name an ordered pair (x,y) that is a solution of the equation y = 3x + 2.
   Solution: (0, 2)
2. If x and y are any real numbers, how many solutions does the equation y = -2x + 5 have?
   Solution: An infinite number
3. What do the graphs of y = 3x + 2 and y = -2x + 5 look like?
   Solution: Straight lines
4. In how many points can two distinct straight lines intersect?
   Solution: 1 point
5. The graphs of y = 3x + 2 and y = -2x + 5 intersect. What do you know about the point of intersection?
   Solution: The point of intersection is a solution for both equations.

3-1 Systems and Graphs

System of equations: Two or more equations that state relationships between the same variable quantities.

Ex: y=10x
y=2x+400

Linear system: A system of linear equations. *remember, linear = lines

Solution for a system of equations: The point of intersection. An ordered pair whose coordinates make all the equations in the system true.

Ex: The point (5,15) is a solution to y=2x+5 and y=-x+20 because when you plug in 5 for x and 15 for y it makes the equations equal.

Horizontal intercept: The place where a graph intersects the horizontal axis.

System of inequalities: Two or more inequalities that state relationships between the same variable quantities. The <u>solution region</u> lies in the overlapped shaded regions.

System of equations

If x + 2 = 5, then x = 3 is a solution *A solution is what makes the equation true.*

Example 1:

Solve by graphing:
$$x + y = 9$$
$$-x + 5y = -15$$

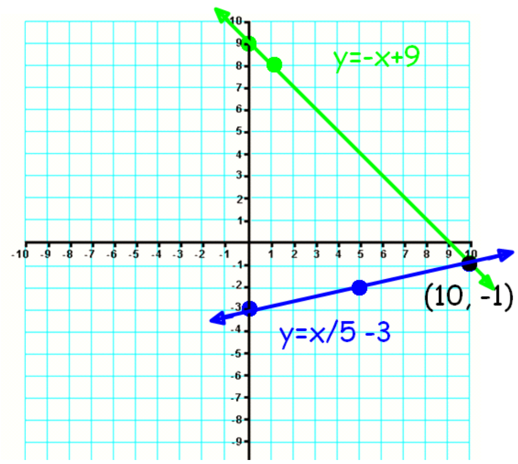
Solution

Graph both equations on the same x-y plane. The solution is where they intersect!

*Put both equations in slope-intercept form (easier to graph in this form)

$$x + y = 9$$
$$-x \quad -x$$
$$y = -x + 9$$

$$-x + 5y = -15$$
$$+x \qquad +x$$
$$5y = x - 15$$
$$\overline{5} \qquad \overline{5}$$
$$y = \frac{x}{5} - 3$$



The two lines intersect at (10, -1). Therefore, the solution to the system of equations is (10, -1).

Example 2: Season tickets for the University's 15 home basketball games has a package price of $120 or $12 per game if purchased individually. How many games does a fan have to attend to make it worth buying the season package?

Solution

Let c = cost of tickets Let n = number of tickets

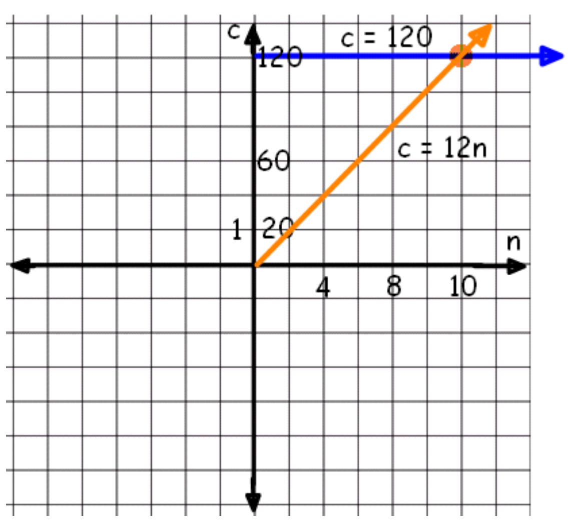
Write the system of equations based on each option for attending the games (buying the package deal vs paying for each game)

The system of equations is:

c= 120

c = 12n

Graph the two equations on the same xy plane.



The point of intersection, (10, 120), is the solution to both equations. So, a fan should buy season tickets if the fan plans to attend 11 or more games.

System of inequalities

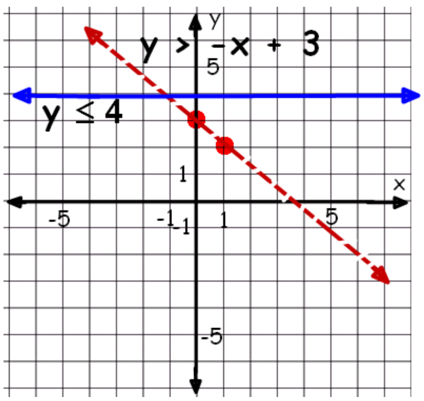
Example 3: Solve by graphing:

$y > -x + 3$

$y \le 4$

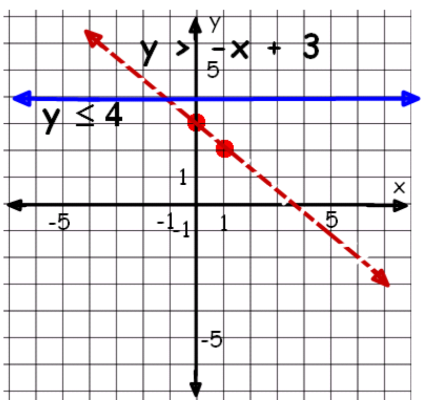
Solution

Graph the two inequalities



y > -x + 3 is a dashed line (no equals bar) and shaded above the line (b/c its greater than).

y ≤ 4 is a solid line at y = 4 and shaded below (b/c it is less than).



The overlapped region is the solution set.

Side-note: To determine where to shade with inequalities, pick an ordered pair and see if it makes the inequality true. If the line doesn't go through (0, 0), choose that point. If (0, 0) is true, shade so it is included. If it makes the inequality false, shade so it isn't part of the shaded region.

If true, shade side containing (0,0).

If false, shade side not containing (0,0).

OR

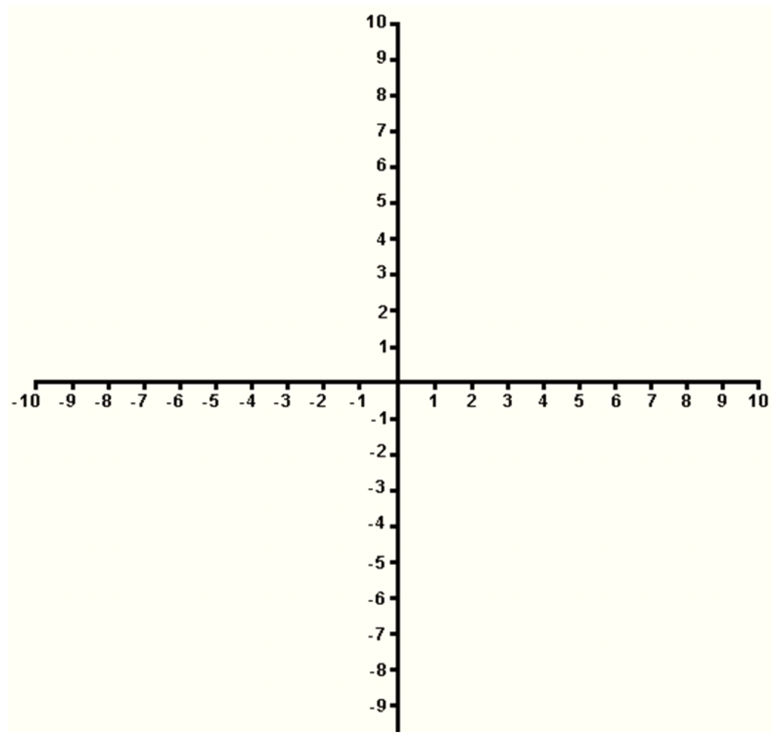
Remember: < or ≤ : Shade below the line > or ≥ : Shade above the line

Also… < or > dashed line ≤ or ≥ solid line

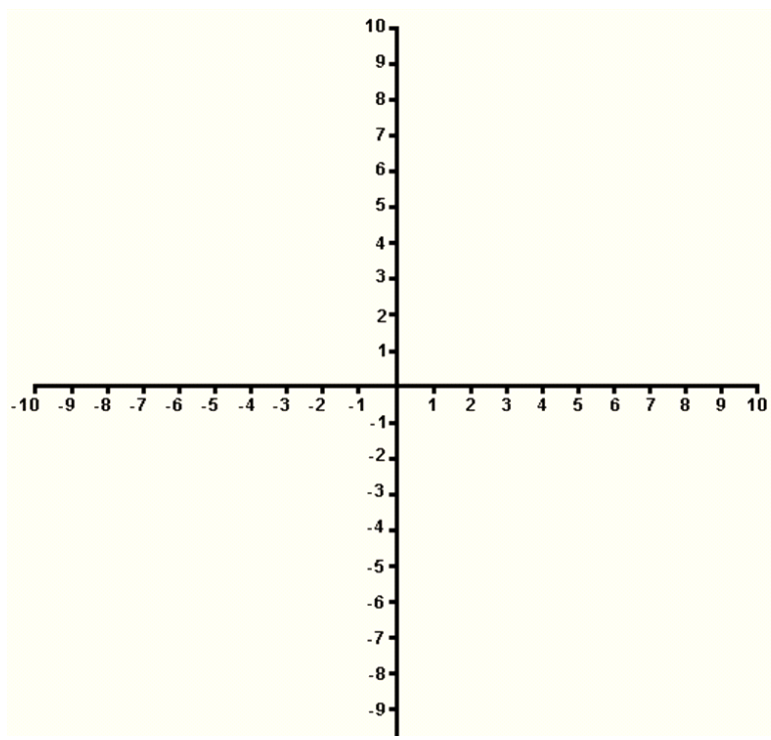
Try the following problems on your own…we will compare our answers in a few minutes:

Example 4: Solve by graphing

$y = 10$
$x + y = 4$



Example 5: Solve by graphing
$y < x + 2$
$x + y \geq 4$



Homework:
Read pg. 121-125
Pg. 125 #2, 3, 6-9, 13-16, 19-20, 22, 25-31, 4